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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/873,614

06/04/2001

Paul S. Weiss

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03/31/2004

MCKEE, VOORHEES & SEASE, P.L.C.
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DES MOINES, IA 50309-2721

EXAMINER

NGUYEN, KHIEM D

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 03/31/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/873,614

Applicant(s)

WEISS ET AL.

Examiner

Khiem D Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) 30-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 and 33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The non-final rejection as set forth in paper No. (10) is withdrawn in response to applicants' amendments. A new rejection is made as set forth in this Office Action.

Claims (1-33) are pending in the application in which claims 30-32 are withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-12, 14, 16-29, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marukawa et al. (U.S. Patent 5,627,090) in view of Shinji Matsui (IEEE Vol. 85, No. 4, April 1997).

In re claim 1, Marukawa discloses a method for manufacturing nanostructure patterns comprising (FIGS. 1-5 and related text): Overlaying a multilayer molecule resist (FIG. 4: 5 and 6) on at least a portion of at least one parent structure (FIG. 4: 3 and 4) selectively deposited on a substrate (FIG. 4: 1); depositing a layer (FIG. 4: 7) over the at least one parent structure and in contact with at least a portion of the multilayer resist; and removing the multilayer molecule resist to leave a residual structure (FIG. 5: 7a).

Marukawa does not explicitly disclose wherein the multilayer resist is a multilayer organic molecule resist.

Matsui discloses a method for manufacturing nanostructure patterns comprising (pages 630-632 and **FIGS. 1-34**): Overlaying an organic molecule resist on at least a portion of at least one parent structure (page 631); depositing Au-Pd metal over the at least one parent structure and in contact with at least a portion of the organic molecule resist; and lift-off the organic molecule resist to leave a residual structure (page 632). It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Marukawa and Matsui to enable the multilayer organic molecule resist of Marukawa to be formed and furthermore to obtain high resolution, high overlay accuracy, and convenient for a nanodevice fabrication process (page 631).

In re claims 2 and 3, **Matsui** discloses wherein the steps of removing the organic resist is chemical and electrochemical (pages 631-632).

In re claim 4, **Marukawa** discloses wherein the steps of removing the multilayer molecule resist removes a portion of the deposited layer (**FIGS. 1-5**). Additionally, Matsui also discloses wherein the steps of removing the multilayer organic molecule resist removes a portion of the deposited layer (page 631).

In re claims 5-8, **Matsui** discloses wherein the residual structure includes a line, a dot, or a ring (pages 631-632) and wherein the residual structure includes two or more adjacent lines (pages 631-632).

In re claim 9, **Marukawa** discloses wherein a first portion of the at least one parent structure (**FIG. 4: 3**) is a first material and a second portion (**FIG. 4: 4**) of the at least one parent structure is a second material (col. 8, lines 2-10).

In re claims 10-11, it is well-known to one of ordinary skill in the art of making semiconductor devices to image the nano residual structure with scanning probe microscopy because at lower target concentrations, the nano residual structure could not be visualized with the naked eye.

In re claim 12, Marukawa discloses wherein the substrate is a semiconductor substrate (col. 8, lines 16-22) and Matsui discloses wherein the substrate is silicon (**FIG. 25**).

In re claim 14, Marukawa discloses wherein the layers of the multilayer organic molecule resist are connected with ions (col. 8, lines 2-39).

In re claims 16, 17, 18, Marukawa discloses smoothing the at least one parent structure (col. 8, lines 8-13) and is accomplished chemically or electrochemically. Additionally, Matsui also discloses smoothing the at least one parent structure and is accomplished chemically or electrochemically (page 632).

In re claim 19, Marukawa discloses designing the at least one parent structure (**FIG. 5: 3, 4**) to result in the residual structure (**FIG. 5: 7a**) having a width less than a width of the at least one parent structure.

In re claim 20, whether the at least one parent structure to have a concave segment is inherently depends on the desired result one want to obtain.

In re claim 21, Marukawa discloses removing a portion of the residual structure (**FIG. 5**). Additionally, Matsui also discloses removing a portion of the residual structure (page 632).

In re claims 22 and 26-29, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to applied the techniques as taught by Marukawa above to overlaying a second multilayer organic molecule resist on the at least a portion of the residual structure; depositing a layer over the residual structure and in contact with at least a portion of the second multilayer organic resist; and removing the second multilayer organic molecule resist to leave a second residual structure to designing the residual structure to reduce the second residual structure size. Marukawa does not restrict the structure to one layer of organic resist and residual structure. The practitioners may use multiple iterations to form her devices as necessary.

In re claim 23, 24, and 25, Matsui discloses smoothing the residual structure wherein smoothing is accomplished chemically or electrochemically (pages 631-632).

In re claim 33, Marukawa and Matsui discloses designing the at least one parent structure to result in the residual structure being spaced more closely than the at least one parent structure Marukawa (**FIG. 5**) and Matsui (pages 631-632).

2. Claims 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marukawa et al. (U.S. Patent 5,627,090) in view of Shinji Matsui (IEEE Vol. 85, No. 4, April 1997) as applied to claims 1-12, 14, 16-29, and 33 above, and further in view of Hoechst AG (1999 Derwent Information LTD 1976-32210X).

In re claims 13 and 15, Hoechst discloses wherein the organic molecule resist is a mercaptoalkanoic acid and wherein each layer of organic molecules is connected with Cu^{2+} ions (Basic-Abstract). It would have been obvious to one of ordinary skill in the art of making semiconductor devices to combine the teaching of Marukawa, Matsui, and

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Hoechst to enable the organic molecule resist of Marukawa to be formed and furthermore the resist is easily removed after etching or degreasing (Basic-Abstract).

Response to Arguments

In response to Applicants' argument that Marukawa has resist layers made of two different materials wherein the present invention, claim 1, requires resist layers made of only one material, examiner respectfully disagree. The term "multilayer organic molecule resist" as cited by the Applicants in independent claim 1 indicates that there are more than one layers of organic molecule resist because the word multi by itself represents many, much, or multiple (see attachment). For this reason, examiner holds the current rejection proper.

Conclusion

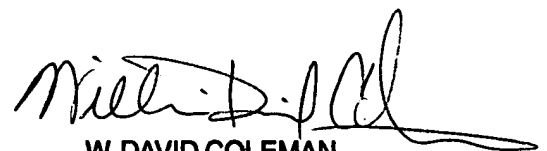
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 305-3432 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.
March 24, 2004



W. DAVID COLEMAN
PRIMARY EXAMINER